Biological Control of the Pink Hibiscus Mealybug, *Maconellicoccus hirsutus* (Green), in the U. S. Territories in the Caribbean, California and Belize, Central America

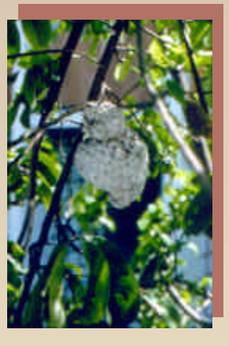
Dale E. Meyerdirk
United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine,
National Biological Control Institute, 4700 River Road, Unit 135, Riverdale, Maryland 20737 USA

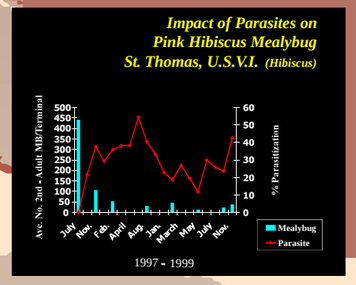
The pink hibiscus mealybug (PHM), *Maconellicoccus hirsutus* (Green), was first found in the Western hemisphere in Grenada in 1994, and has now expanded its geographical distribution to over 25 Caribbean Islands, Guyana in South America and most recently found in Southern California as of August of 1999, Belize, Central America as of September 24, 1999 and in the Bahamas November, 2000. It has not yet been found in other US States such as Florida, or Cuba, Dominican Republic, Haiti, Jamaica, Cayman Islands. It was first detected in St. Kitts and Trinidad and Tobago in 1996, US Virgin Islands by May of 1997, in Vieques and Culebra by June and December of 1997 respectively, and on the mainland of Puerto Rico by April of 1998.

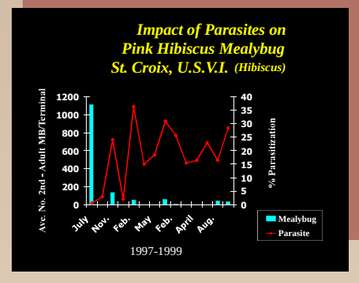
PHM attacks over 200 host plant species, but most common on hibiscus and sour sop (*Annona muricata*) in the Caribbean. Hibiscus plants were used as a standard host for these studies. It has been observed to commonly kill hibiscus plants and closely related species and even some forest trees (*Samanea saman*). Estimated economic losses have been reported to be as high as $3.5 million/year in Grenada, $18 million/year in Trinidad and Tobago, and projected to be a potential loss of $750 million/year in the United States if no control efforts are made once it spreads to all the southern States.

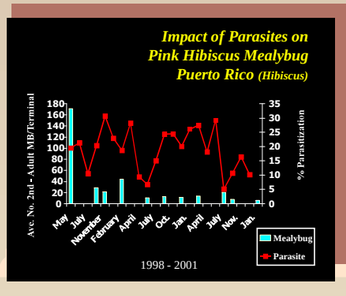
An exotic parasite species, *Anagyrus kamali* (Hymenoptera: Encyrtidae), imported from China was initially released in the US Virgin Islands on St. Thomas in June of 1997. A second species, *Gyranusoidea indica* (Hymenoptera: Encyrtidae), from Egypt was also released at that time. Both parasites have a life cycle producing two generations for every one generation of the mealybug. *Anagyrus kamali*, which is the dominate parasite, has been reported moving up to three miles from initial release points.

By November of 1999, the PHM densities were reduced by 91.2% in St. Thomas and 97.1% in St. Croix . The percent parasitization averaged 31.3% and 18.2% with a high of 54.5% and 36.4% for St. Thomas and St. Croix, respectively.









Parasites were released in Puerto Rico Islands by January 8, 1998 in Culebra, by April 16, 1998 in Vieques and the Mainland of Puerto Rico by May 22, 1998. PHM densities have been reduced by 92.0% on the mainland from May 1998 to March 2000; 96.5% in Vieques from May 1998 to August 1999; and 97.8% in Culebra from May 1998 to August 1999. Parasitization Averaged 19.8% in Puerto Rico, 31.6% in Culebra and 24.8% in Vieques; and reached a high of 30.7%, 48.1% and 48.2% on each Island, respectively, during this same period. The PHM has only spread across one third of Puerto Rico from east to west much slower then anticipated, because of the early presence and impact of the parasites. A study indicated that 80% of the new mealybug infested locations in Puerto Rico were being attacked by the exotic parasite species, which appear to be moving naturally with the spread of this Mealybug.

Imperial County of Southern California was reported to be infested by the PHM in August of 1999. PHM was attacking mulberry trees, figs, grapes, hibiscus, silk oak trees, carob trees, coral trees, pomegranate, etc.

Population densities of the PHM averaged just over 200 mealybugs/mulberry terminal by September of 1999, during which *A. kamali* and *G. Indica* in a cooperative effort with the California Department of Food and Agriculture (CDFA) were released that same month. CDFA also developed an insectary operation for additional parasite releases as needed at other infested sites. By January of 2000, all leaves had fallen from the tree and only traces of the PHM were detected during the cooler winter months. By September of 2000, the PHM population density at the mulberry study sites had declined by 96% averaging 9.5 mealybugs/terminal. Parasitism reached a high of 67.4% in September of 2000. Carob tree infestations of PHM declined after parasite releases by 93% from June of 2000 to September 2000 averaging 120.2 mealybugs/terminal in June and reduced to 8.4 mealybugs/terminal by September.

The PHM was first reported in Belize, Central America in September of 1999. These same parasites were released by November 16, 1999 at a rate of 200 to 400 parasites per release site. Within one year (November 1999 to September 2000) the PHM population densities had been reduced by 96.6% on hibiscus shrubs. Parasitization increased from 0% in November of 1999, when the parasites were first released, to a high of 53.4% by February of 2000.

PHM is reported to be under complete biological control in St. Kitts, US Virgin Islands, Puerto Rico, Trinidad and Tobago, Grenada, and numerous other Caribbean Islands, plus most recently Southern California after one year of parasite releases.